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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/798,959

03/10/2004

Miao-Cheng Liao

67,200-1155

7717

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12/22/2005

TUNG & ASSOCIATES

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EXAMINER

TRAN, LONG K

ART UNIT

PAPER NUMBER

2818

DATE MAILED: 12/22/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/798,959

Applicant(s)

LIAO ET AL.

Examiner

Long K. Tran

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 November 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 - 42 is/are pending in the application.
- 4a) Of the above claim(s) 1 - 24 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 25 - 42 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

1. Applicant's election with traverse of Group II, Claims **25 – 42** in the reply filed on November 09, 2005 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

The requirement is still deemed proper and is therefore made FINAL.

2. Claims **1 – 24** are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected Group I, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in the reply filed on November 09, 2005.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims **25, 26, 34** and **35** are rejected under 35 U.S.C. 102(e) as being anticipated by Shimizu et al. (US Patent Publication No. 2005/0040481).

Regarding claim **25**, Shimizu discloses an MIM capacitor structure for use in mixed mode electronic processing comprising:

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a bottom conductive electrode 53 (fig. 14);

a first protection layer 54 (fig. 14) on the conductive electrode 53; a dielectric layer 55 (fig. 14) on the first protection layer 54; and

an upper conductive electrode 57 (fig. 14) on the dielectric layer.

See paragraphs [0310] – [0312]

In addition, the recitation that “for use in a mixed mode electronic processing” has not been given patentable weight because it has been held that a preamble is denied the effect of limitation where the claim following the preamble is a self-contained description of the structure not depending for completeness upon the introductory clause. *Kropa V. Robie*, 88 USPQ 478 (CCPA 1951).

Regarding claim **26**, Shimizu discloses the MIM capacitor structure further comprising a second protection layer 56 (fig. 14; [0312]) disposed between the dielectric layer 55 and the upper conductive electrode 57.

Regarding claim **34**, Shimizu discloses an MIM capacitor structure for use in mixed mode electronic processing comprising:

a bottom conductive electrode 53 (fig. 14);

a dielectric layer 55 (fig. 14) on the first protection layer 54;

a top protection layer 56 (fig. 14) on the dielectric layer; and

a top conductive electrode 57 (fig. 14) on the dielectric layer.

See paragraphs [0310] – [0312]

In addition, the recitation that “for use in a mixed mode electronic processing” has not been given patentable weight because it has been held that a preamble is

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denied the effect of limitation where the claim following the preamble is a self-contained description of the structure not depending for completeness upon the introductory clause. *Kropa V. Robie*, 88 USPQ 478 (CCPA 1951).

Regarding claim **35**, Shimizu discloses the MIM capacitor structure further comprising a bottom protection layer 54 (fig. 14; [0312]) disposed between the bottom conductive electrode 53 and the dielectric layer 55.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims **27, 28, 36** and **37** are rejected under 35 U.S.C. 103(a) as being unpatentable over Shimizu et al. (US Patent Publication No. 2005/0040481). in view of Ohtsuki (US Patent Application Publication No. 2002/0098644).

Regarding claims **27, 28, 36** and **37**, Shimizu discloses the claimed invention of claim 25 and claim 26 respectively but fails to teach the first and second protection layers comprise a silicon rich oxide (SRO) having a relatively higher silicon content compared to stoichiometric SiO₂ as cited in the instant claims.

Kwon does not explicitly teach the upper electrode including a noble metal.

However, SRO is a known material in semiconductor art for forming capacitor's electrode stacked structure as shown by Ohtsuki ([0065]) which includes an SRO layer over a bottom electrode 110 and an SRO over the dielectric layer 111.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to employ a well known silicon rich oxide (SRO) having a relatively higher silicon content compared to stoichiometric SiO_2 SRO as shown by Ohtsuki in place of the protection layers of Shimizu's device, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for a specific application.

7. Claim **29**, **30**, **33** and **42** are rejected under 35 U.S.C. 103(a) as being unpatentable over Shimizu et al. (US Patent Publication No. 2005/0040481) in view of Huang et al. (US Patent No. 6,916,722).

Regarding claims **29** and **38**, Shimizu discloses the claimed invention of claims 25 and 34 respectively, except for an uppermost portion of the bottom and upper conductive electrodes comprise a material selected from the group consisting of Ta, TaN, and TaSiN.

However, Ta and TaN are known materials in semiconductor art for forming bottom and top electrodes of a MIM capacitor as taught by Huang (column 5, lines 56 – 59).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to employ a well known Ta and TaN as shown by Huang for forming the uppermost portion of the bottom and upper conductive electrodes of Shimizu MIM capacitor in order to improve performance of capacitance voltage linearity (column 5, lines 56 – 59).

Regarding claims **30** and **39**, Shimizu discloses the claimed invention of claims 25 and 34 respectively, except the dielectric layer comprises PECVD silicon oxide.

However, SiO₂ is a known material in semiconductor art for forming a dielectric layer of a MIM capacitor as taught by Huang (column 4, lines 11-15).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to employ a well known material such as SiO₂ as taught by Huang for forming the dielectric layer of Shimizu MIM capacitor in order to enable the integration of creating a metal capacitor into conventional semiconductor processing (column 5, lines 60 – 65).

In addition Shimizu and Huang do not show the dielectric layer is a PECVD silicon oxide. However the respective limitations are taken to be a product by process limitation and considered non-limitations. In the product by process claim, it is the patentability product and not of recited process steps which must be established. Therefore, when the prior art discloses a product which reasonably appears to be identical with or only slightly different than the product claimed in a product-by process claim, a rejection based on sections 102 or 103 is fair. A product by process claim directed to the product per se, no matter how actually made, *In re Hirao*, 190 USPQ 15 at 17 (footnote 3). See *In re Fessman*, 180 USPQ 324,326(CCPA 1974); *In re Marosi et al.*, 218 USPQ 289,292 (Fed. Cir. 1983); and particularly *In re Thorpe*, 227 USPQ 964,966 (Fed. Cir. 1985), all of which make it clear that it is the patentability of the final structure of the product “gleaned” from the process steps, which must be determined in a “product by process ” claim, and not the patentability of the process. See also MPEP

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2113. Moreover, an old or obvious product produced by a new method is not a patentable product, whether claim in “product by process” claim or not. Note that applicant has the burden of proof in such cases, as the above case-law makes clear.

Regarding claims **33** and **42**, Shimizu discloses the claimed invention of claims 25 and 34 respectively, except for the upper and bottom conductive electrodes comprise a material selected from the group consisting of aluminum, copper, tantalum, tungsten, titanium, and alloys thereof.

However, aluminum, copper, tantalum, tungsten, titanium, and alloys thereof are known materials in semiconductor art for forming bottom and top electrodes of a MIM capacitor as taught by Huang (column 5, lines 56 – 59).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to employ a well known tantalum as shown by Huang for forming the upper and bottom conductive electrodes of Shimizu MIM capacitor in order to improve performance of capacitance voltage linearity (column 5, lines 56 – 59).

8. Claims **31**, **32**, **40** and **41** are rejected under 35 U.S.C. 103(a) as being unpatentable over Shimizu et al. (US Patent Publication No. 2005/0040481)

Regarding claims **31**, **32**, **40** and **41**, Shimizu discloses the claimed invention of claim 25, 26, 34 and 35 respectively but fails to teach the first and second protection layers are formed having thickness between about 25 Å to about 200 Å.

However, it would have been well known in the art that the selection of those parameters such as **energy**, **concentration**, **temperature**, **time**, **molar fraction**, **depth**, **thickness**, etc., would have been obvious and involve routine optimization

which has been held to be within the level of ordinary skill in the art. "Normally, it is to be expected that a change in **energy, concentration, temperature, time, molar fraction, depth, thickness, etc., or in combination of the parameters** would be an unpatentable modification. Under some circumstances, however, changes such as these may impart patentability to a process if the particular ranges claimed produce a new and unexpected result which is different in kind and not merely degree from the results of the prior art ... such ranges are termed "critical ranges and the applicant has the burden of proving such criticality.... More particularly, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Long K. Tran whose telephone number is 571-272-1797. The examiner can normally be reached on Mon-Thu.

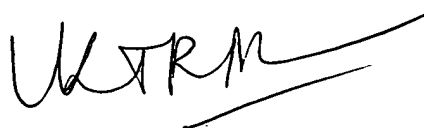
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Nelms can be reached on 571-272-1787. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

LKT

December 17, 2005

A handwritten signature in black ink, appearing to read "ULRM", with a long horizontal stroke extending to the right.